THESIS

THE FEASIBILITY OF USING A STEAM TRAP AS A WATER METER

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Senior Mechanical Thesis

on

"THE FEASIBILITY OF USING A STEAM TRAP AS A WATER METER."

by

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The problem:- There are many cases in general steam engineering practice where it is desirable to use steam pressures which are variable or constant, and where it is desirable to measure in some way the amount of steam used; in some cases an expensive meter is employed, either on the steam line or in measuring the water of condensation in the return. In the majority of these cases we must resort to steam trap to prevent the escape of the live steam and to drain the pipes of the water of condensation. For example, a man uses a boiler to furnish steam for an engine to run a mill of some kind. His neighbor has a small plant, and it would not be profitable for him to run a boiler to furnish steam for heating and ventilating or for drying in a small kiln. The mill owner can furnish him with a limited amount of steam, at a very low cost. In order to do this he must know exactly how much steam he is furnishing his neighbor. To take account of this steam a meter of some kind must be placed in the line, and a steam trap must be employed to drain the piping system. A steam trap large enough to take care of the water coming from the pipes may be procured at a low cost. A Nason Bucket trap to drain

2,700 ft. of 1" pipe costs	$ 8.00
4,200 " " " " "	11.00
6,000 " " " " "	17.00

Water meters to take care of the same amounts of water may be had for the following prices:

1	about	32	gals.	water	per	hour,	$ 8.00
2	"	52	"	"	"	"	$12.00
3	"	75	"	"	"	"	$12.00

The trap and meter together would amount to respectively:

$16.00 $23.00 $29.00

If we were to use a steam trap along we would have to add the cost of the registering device, which would cost, as near as we can estimate it, for the above three sizes

$3.00 $4.00 $5.00

The problem, as proposed to us, is to use a steam trap that discharges the collected water at intervals; that is, the discharge is intermittent, the rapidity depending on the pressure and the amount of water of condensation. The Nason, Bundy and Phoenix are types of this class. By counting the number of dumps, or discharges, and by finding the amount of water discharged per dump, we find the total water that flows through the trap.

The first steam trap experimented on was a No. 3 Nason Bucket trap, guaranteed to drain 1,400 square feet of radiation. In order to procure this amount of radiation we used two "box coil" radiators having 86 feet of one inch pipe each and 29 square feet cooling surface. We connected the radiators together in parallel, and placed them in a water-tight box 22" x 24" x 60". To the box runs a cold water pipe, 1 1/2" diam., to carry cold water to condense the steam in the coils. An outlet was provided at the top to carry away the hot water formed by the heating of the steam coils. One end of the coils was connected to a steam main, where a steam pressure up to 60 lbs may be had, while the other end was piped to the steam trap. The water, after leaving the steam trap, was piped to a barrel set on a pair of scales, so that the amount of water at each discharge of the trap could be accurately measured.

In order to escape the difficulty of applying the registering device directly to the trap itself and working the counter by the motion of the trap, a separate apparatus was used to count the number of discharges.

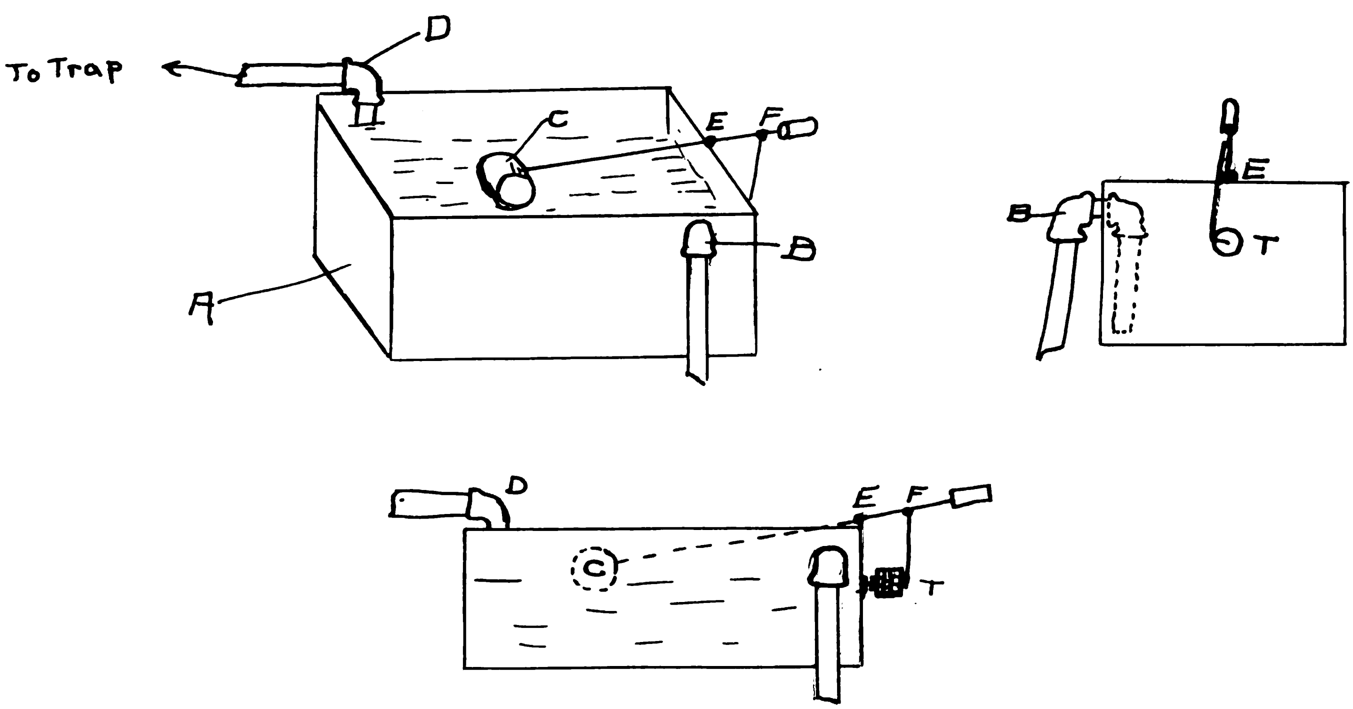

Fig 1

REGISTERING DEVICE

In Fig. 1 "D" is the pipe conducting the water from the trap to the box, "A". When the trap dumps, the box "A" fills with water. The float "C" which fastened to a rod with a bearing at "E", rises with the water in the box, and records the discharge on the cyclometer "T". When the box is full (it fills at every discharge of the trap) the siphon "B" draws all the water out of the box "A". The float "C" then falls to the bottom of the box "A" by its own weight, and everything is ready for another discharge.

The following figures are the results of three days experiments with a No. 3 Nason Bucket trap:

First Day.

Steam Pressure	Number of Discharges.	Total water in lbs.	Lbs. of water per discharge.
5 #	No regular discharge		
10 #	10	125 #	12.5 #
15 #	10	122.5 #	12.25 #
20 #	10	148 #	14.8 #
20 #	10	126 #	12.6 #

Second Day.

5 #	No regular discharge.		
10 #	10	119 #	11.9 #
15 #	10	129 #	12.9 #
20 #	10	136 #	13.6 #

Third Day.

5 #	No regular discharge.		
10 #	10	127 #	12.7 #
15 #	10	127.5 #	12.75 #
20 #	10	137.5 #	13.75 #
25 #	10	144 #	14.4 #

The above results of our experiments, although limited, seem to indicate that the desired result cannot be obtained because the amount of water discharged per dump is not the same for different pressures, and we have no regular discharge with pressures below 7 #. The failure to discharge at low pressures may be assigned to friction in the parts, or to a leaky valve in the trap, but precautions were taken against both.

A No. 11 Bundy Hydrox trap was experimented on next. The dumps of this trap were too rapid for us to take account of them, therefore the trap was useless for our purpose.

From the construction of the Bundy High Pressure steam trap, we are led to believe that it could be used as a combined steam trap and water meter.

We were handicapped in this work by not having at our disposal a variety of steam traps to experiment with; if we had more traps with us perhaps the results would be otherwise.

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